

## WHAT IS CLAIMED IS:

1. A sonde housing, comprising:
  - a) a main body having a first end and a second end;
  - b) a fluid passage within the main body that provides fluid communication between the first and the second end of the main body;
  - c) a first end piece and a second end piece, the first and second end pieces having fluid passages, the first end piece being welded to the first end of the main body and the second end piece being welded to the second end of the main body, the fluid passages of the first and second end pieces corresponding to the fluid passage within the main body to provide a continuous fluid passageway through the sonde housing; and
  - d) a recess located within the main body of the sonde housing for radially receiving a sonde, the recess being isolated from the fluid passageway.
2. The sonde housing of claim 1, further including a first void and a second void, the first and second voids being defined between the welded first and second end pieces and the main body, the first and second voids providing fluid communication between the fluid passage of the main body and the fluid passages of the first and second end pieces.
3. The sonde housing of claim 1, further including a housing door that encloses the recess of the main body.
4. The sonde housing of claim 3, further including a first and a second mounting block for mounting a sonde, the mounting blocks being sized for receipt within the recess of the main body.
5. The sonde housing of claim 4, further including isolators positioned within the recess adjacent to the first and second mounting blocks to isolate longitudinal forces experienced by the sonde.

6. The sonde housing of claim 4, wherein the mounting blocks further include at least one o-ring, and wherein the recess and the housing door are configured to cooperate with the o-ring of the first and second mounting blocks to isolate radial forces experienced by the sonde.

7. The sonde housing of claim 6 wherein the mounting blocks include an internal o-ring.

8. The sonde housing of claim 6 wherein the mounting blocks include an external o-ring.

9. The sonde housing of claim 6 wherein the mounting blocks include an external o-ring and an internal o-ring.

10. The sonde housing of claim 1, wherein the first and second end pieces include projections that fit within openings located at the first and second ends of the main body.

11. The sonde housing of claim 1, further comprising a plurality of fluid passages within the main body, each of the fluid passages providing fluid communication between the first and second end of the main body.

12. The sonde housing of claim 1, further comprising a sonde mounted within the recess of the sonde housing, the sonde having a longitudinal axis wherein the longitudinal axis of the mounted sonde can be aligned relative to a longitudinal axis of the sonde housing.

13. The sonde housing of claim 1, further comprising a sonde mounted within the recess of the sonde housing, wherein the mounted sonde can be rotationally oriented to a selected rotational position, the selected rotational position being one of a plurality of rotational positions.

14. The sonde housing of claim 13, further comprising a locking device that secures the sonde at the selected rotational position.

15. The sonde housing of claim 1, wherein the first and second end pieces include threaded connections for coupling drilling components to each of the end pieces.

16. A method of making a one-piece sonde housing, the method of making comprising:

a) providing a main body having first and second ends, the main body further including:

- i) a recess located between the first and second ends for receipt of a sonde;
- ii) a fluid passage extending longitudinally through the main body;
- iii) body connection portions located at each of the first and second ends of the main body;

b) providing first and second end members, each of the first and second end members having an end connection portion that corresponds to the body connection portion of the main body, each of the first and second end members also having a fluid passage;

c) coupling the first and second end members with the first and second ends of the main body to form internal voids that connect the fluid passage of the first and second end members with the fluid passage of the main body; and

d) welding the first and the second end members to the first and second ends of the main body to provide the one-piece sonde housing having internal voids that facilitate fluid communication between the main body and the end members.

17. The method of making the one-piece housing of claim 16, wherein the body connection portions of the main body have a first length, the end connection portions of the end members have a second length and the internal voids are formed by the difference in length between the first length of the body connection portion and the second length of the end connection portion.

18. The method of making the one-piece sonde housing of claim 17, further including configuring the body connection portions as female connection portions and configuring the end connection portions as male connection portions, wherein the first length of the female connection portion is greater than the second length of the male connection portions.

19. A method of rotationally orienting a sonde within a sonde housing, the method comprising:

- a) providing a radially accessible recess within the sonde housing;
- b) providing first and second mounting supports that support the sonde, the mounting supports being configured to remain stationary when placed within the recess of the sonde housing;
- c) assembling the sonde within the first and second mounting supports;
- d) placing the sonde and the supports within the sonde housing recess;
- e) rotating the mounted sonde relative to the sonde housing to a selected rotational position; and
- f) securing the rotational position of the sonde relative to the sonde housing.

20. The method of claim 19, wherein the sonde can be rotated to an infinite number of rotational positions.

21. The method of claim 19, further including providing a cover having a rib portion and assembling the cover to the sonde housing recess such that the portion extends into the sonde housing recess.

22. The method of claim 21, further including providing a gear piece fixedly secured to the sonde wherein the rib portion of the cover engages the gear piece when the cover is assembled onto the sonde housing to secure the rotational position of the sonde relative to the sonde housing.

23. The method of claim 21, further including providing a plug that is rotationally secured to the sonde wherein the rib portion of the cover engages the plug to prohibit rotation of the sonde relative to the sonde housing when the cover is assembled onto the sonde housing.

24. The method of claim 21, further including providing an o-ring in contact with an outer diameter of the sonde wherein the rib portion of the cover engages the o-ring such that the o-ring is compressed against the sonde to prohibit rotation of the sonde relative to the sonde housing when the cover is assembled onto the sonde housing.

25. The method of claim 19, wherein the rotational position of the sonde is secured relative to the sonde housing by inserting a screw through a hole in the first mounting support and into a plug that is rotationally secured to the sonde.

26. A method of rotationally orienting a sonde within a sonde housing, the method comprising:

- a) providing a radially accessed recess within the sonde housing;
- b) providing first and second mounting supports that support the sonde, the mounting supports being configured to remain stationary when placed within the recess of the sonde housing;
- c) providing a plug sized to fit within one of the first and second mounting supports, the plug including a plug slot corresponding to a sonde slot on the sonde, the slots providing a rotational interlock between the plug and the sonde;
- d) assembling the sonde within the first and second mounting supports;
- e) placing the sonde and the supports within the sonde housing recess;
- f) rotating the sonde to a selected rotational position wherein the sonde is rotated within the recess and relative to the sonde housing, and wherein the interlocked plug is correspondingly rotated relative to the stationary mounting supports; and
- g) securing the plug in the selected rotational position with a screw to lock the rotary orientation of the plug relative to the stationary mounting supports, thereby

locking the rotary orientation of the sonde relative to the mounting supports and the sonde housing.

27. The method of claim 26 wherein the screw extends through the mounting support and into the plug.

28. The method of claim 26 wherein the screw engages a threaded hole in the mounting support and contacts a surface of the plug to prevent rotation of the plug.

29. A method of rotationally orienting a sonde within a sonde housing, the method comprising:

- a) providing a radially accessed recess within the sonde housing;
- b) providing first and second mounting supports that support the sonde, the mounting supports being configured to remain stationary when placed within the recess of the sonde housing;
- c) providing a cover configured to enclose the recess of the sonde housing, the cover including a rib portion that extends into the recess when the cover is placed over the recess;
- d) providing a gear coupled to the sonde, the gear including a plurality of radially extending teeth;
- e) fixedly securing the gear to the sonde;
- f) assembling the sonde within the first and second mounting supports;
- g) placing the sonde and the supports within the sonde housing recess;
- h) rotating the sonde to a selected rotational position wherein the sonde is rotated within the recess and relative to the stationary mounting supports; and
- i) securing the cover to the sonde housing such that the rib portion of the cover engages with the gear teeth to lock the rotary orientation of the sonde relative to the sonde housing.

30. A method of rotationally orienting a sonde within a sonde housing, the method comprising:

- a) providing a radially accessed recess within the sonde housing;
- b) providing first and second mounting supports that support the sonde, the mounting supports being configured to remain stationary when placed within the recess of the sonde housing;
- c) providing a cover configured to enclose the recess of the sonde housing, the cover including a rib portion that extends into the recess when the cover is placed over the recess;
- d) providing a plug, rotationally securing the plug to the sonde, and mounting an external o-ring on an external surface of the plug;
- e) assembling the sonde and the plug within the first and second mounting supports;
- f) placing the sonde and the supports within the sonde housing recess;
- g) rotating the sonde to a selected rotational position wherein the sonde is rotated within the recess and relative to the stationary mounting supports; and
- h) securing the cover to the sonde housing such that the rib portion of the cover engages the o-ring of the plug to lock the rotary orientation of the sonde relative to the sonde housing.

31. A method of rotationally orienting a sonde within a sonde housing, the method comprising:

- a) providing a radially accessed recess within the sonde housing;
- b) providing first and second mounting supports that support the sonde, the mounting supports being configured to remain stationary when placed within the recess of the sonde housing;
- c) providing a cover configured to enclose the recess of the sonde housing, the cover including a rib portion that extends into the recess when the cover is placed over the recess;
- d) providing a plug and rotationally securing the plug to the sonde;
- e) assembling the sonde and the plug within the first and second mounting supports;
- f) placing the sonde and the supports within the sonde housing recess;

g) rotating the sonde to a selected rotational position wherein the sonde is rotated within the recess and relative to the stationary mounting supports; and

h) securing the cover to the sonde housing such that the rib portion of the cover engages the plug to lock the rotary orientation of the sonde relative to the sonde housing.

32. A method of rotationally orienting a sonde within a sonde housing, the method comprising:

a) providing a radially accessed recess within the sonde housing;

b) providing first and second mounting supports that support the sonde, the mounting supports being configured to remain stationary when placed within the recess of the sonde housing;

c) providing a cover configured to enclose the recess of the sonde housing, the cover including a rib portion that extends into the recess when the cover is placed over the recess;

d) providing an o-ring having an inner diameter and an outer diameter, the inner diameter of the o-ring in a free state being less than an outer diameter of the sonde;

e) securely placing the o-ring on the sonde;

f) assembling the sonde within the first and second mounting supports;

g) placing the sonde and the supports within the sonde housing recess;

h) rotating the sonde to a selected rotational position wherein the sonde is rotated within the recess and relative to the stationary mounting supports; and

i) securing the cover to the sonde housing such that the rib portion of the cover engages the outer diameter of the o-ring securely placed on the sonde to lock the rotary orientation of the sonde relative to the sonde housing.

33. A method of orienting the pitch of a sonde within a sonde housing, the method comprising:

a) providing a recess within the sonde housing for receipt of the sonde, the sonde housing having a longitudinal dimension;



- b) providing mounting supports sized to be received within the recess of the sonde housing;
- c) assembling the sonde within the mounting supports;
- d) placing the mounting supports and the sonde within the recess of the sonde housing; and
- e) adjusting the longitudinal alignment of the mounted sonde in relation to the longitudinal dimension of the sonde housing.

34. A method of orienting the pitch of a sonde within a sonde housing, the method comprising:

- a) providing a recess within the sonde housing for receipt of the sonde, the sonde housing having a longitudinal dimension;
- b) providing a mounting block sized to be received within the recess of the sonde housing, the mounting block being configured to support an end of the sonde;
- c) providing an adjustment assembly sized to be received within the sonde housing, the adjustment assembly including:
  - i) an upper base having a threaded through-hole;
  - ii) a set screw received within the threaded through-hole of the upper base;
  - iii) a lower base having a first surface adjacent the upper base wherein the set screw contacts the first surface when threaded a distance within the through-hole to correspondingly adjusting the position of the upper base relative to the lower base;
  - iv) a supporting cap coupled to the upper base, the supporting cap being configured to support the other end of the sonde, the supporting cap having an centerline that aligns with a longitudinal dimension of the sonde when the sonde is supported by supporting cap;
- d) assembling one end of the sonde with the mounting block and assembling the other end of the sonde within the supporting cap of the adjustment assembly;
- e) placing the mounting block, sonde, and adjustment assembly within the recess of the sonde housing, wherein the end of the sonde assembled to the mounting block remains in a generally fixed position;

- f) determining the sonde alignment of the sonde longitudinal dimension in relation to the longitudinal dimension of the sonde housing; and
- g) adjusting the set screw of the adjustment assembly to selectively adjust the position of the upper base relative to the lower base, and correspondingly the alignment of the centerline of the supporting cap, thereby adjusting the alignment of the longitudinal dimension of the sonde with respect to the sonde housing.

35. A sonde housing system, the sonde housing system comprising:

- a) a sonde housing configured to radially receive a wire-powered sonde or a battery-powered sonde, the sonde housing including:
  - i) a cavity located within a main portion of the sonde housing;
  - ii) at least one fluid passageway for providing fluid communication between a first end of the sonde housing and a second end of the sonde housing;
  - iii) a wire passage providing a pathway between the second void and the cavity; and
- b) a first plug sized for receipt within the wire passage to seal the cavity from the fluid passageway, wherein the first plug comprises a solid construction for use with a battery-powered sonde; and
- c) a second plug sized for receipt with the wire passage to seal the cavity from the fluid passageway, the second plug including an sealing insert having a hole for use with a wire-powered sonde having a wire, wherein the insert seals around the wire extending through the hole.

36. A sonde housing, the sonde housing comprising:

- a) a housing structure having a fluid passage extending from a first end to a second end of the housing structure, the housing structure further including:
  - i) a cavity located within the housing structure for receiving a sonde;
  - ii) a first recess and a second recess located at the first and second ends of the housing structure, the first and second recesses having a first diameter; and
- b) a first end member and a second end member, each of the end members including:

i) a projection that fits within one of the first and second recesses of the housing structure; and

ii) a tapered thread portion, the tapered thread portion having a major diameter and a minor diameter, wherein the minor diameter of the tapered thread portion is less than the first diameter of the recesses.

37. A sonde housing, comprising:

a) a one-piece housing body having opposite ends, each end configured to provide a connection for coupling a drilling component to the housing body, each end further having an opening to provide fluid communication between the end of the housing body and the coupled drilling component;

b) a fluid passage extending through the one-piece housing body;

c) a first cylindrical space and a second cylindrical space located adjacent each of the openings of the ends, the first and second cylindrical spaces extending radially outward from the openings such that the cylindrical spaces provide fluid communication between the fluid passage of the housing body and the openings of the ends; and

d) a recess located within the housing body for housing a sonde, the recess being isolated from the fluid passage.

38. A sonde mounting arrangement for supporting a sonde within a sonde housing, the sonde mounting arrangement comprising:

a) a side-load sonde recess with the sonde housing;

b) a sonde door that encloses the sonde recess; and

c) a first and second mounting block sized for receipt within the sonde recess, the first and second mounting blocks including cylindrical cavities sized to accept and support the sonde.

39. The sonde mounting arrangement of claim 38, further including a plug that fits within the cylindrical cavity of the mounting block, the plug being rotationally secured to the sonde prior to insertion of the sonde within the mounting block.

40. The sonde mounting arrangement of claim 38, further including isolators positioned within the recess adjacent the first and second mounting blocks to isolate longitudinal forces experienced by the sonde.

41. The sonde mounting arrangement of claim 38, wherein each of the first and second mounting blocks further include at least one o-ring, and wherein the recess and the sonde door are configured to cooperate with the o-ring to isolate radial forces experienced by the sonde.

42. The sonde mounting arrangement of claim 41, wherein the o-ring is an internal o-ring that fits within an internal groove adjacent the cylindrical cavity of the first and second mounting blocks, the internal o-ring having an inner diameter in a free state less than an outer diameter of the sonde.

43. The sonde mounting arrangement of claim 41 wherein the o-ring is an external o-ring that fits within an external groove located at an outer surface of the first and second mounting blocks, the external o-ring having an outer diameter that cooperates with the sonde recess and sonde door to isolate radial forces experienced by the sonde.

44. The sonde mounting arrangement of claims 42, further including an external o-ring wherein the external o-ring fits within an external groove located at an outer surface of the first and second mounting blocks, the external o-ring having an outer diameter that cooperates with the sonde recess and sonde door to isolate radial forces experienced by the sonde.

45. The sonde mounting arrangement of claims 43 further including an internal o-ring wherein the internal o-ring fits within an internal groove adjacent the cylindrical cavity of the first and second mounting blocks, the internal o-ring having an inner diameter in a free state less than an outer diameter of the sonde.